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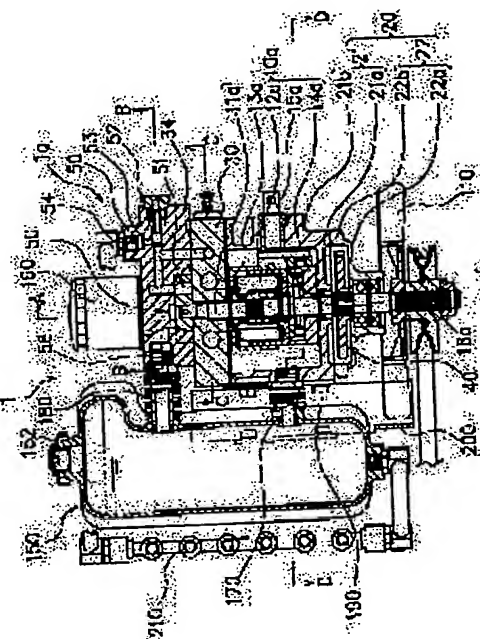
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(54) DUAL TYPE PUMP UNIT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a dual type pump unit capable of effectively suppressing the rise of temperature of a hydraulic oil refilled to a pair of oil pressure lines leading between a hydraulic motor and a hydraulic pump.

SOLUTION: The dual type pump unit is equipped with a first and a second hydraulic pump connected with a first and a second hydraulic motor through each pair of oil pressure lines, the first and second, a center section to support the first and second hydraulic pumps, a housing storing the first and second hydraulic pumps and used as an oil tank, and an oil circulating mechanism to take out the oil from the tank and return the oil into it, wherein the oil circulating mechanism is arranged so as to cool the oil circulating.



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CLAIMS

[Claim(s)]

[Claim 1] It is 2 run pump unit used for the vehicle with which it comes to connect the 1st and 2nd hydraulic motors with a drive-pulley ring on either side, respectively. the [the above 1st and] -- the [the 1st hydraulic pump connected with 2 hydraulic motors with the 1st oil pressure line of a couple, and the 2nd oil pressure line of a couple, respectively, and] -- with 2 hydraulic pumps the [the 1st aforementioned hydraulic pump and] -- the [the pin center, large section which supports 2 hydraulic pumps, and / the 1st aforementioned hydraulic pump and], while 2 hydraulic pumps are held It is 2 run pump unit which picks out an oil from housing used as an oil tank, and the aforementioned oil tank, is equipped with the oil-circuit device again returned in this oil tank, and is characterized by constituting this oil-circuit device so that the oil to circulate can be cooled.

[Claim 2] The aforementioned oil-circuit device is 2 run pump unit according to claim 1 which has the circulation line by which the end section was opened for free passage in the aforementioned oil tank, and the other end was again opened for free passage in the oil tank, and by which at least the part was considered as piping, and is characterized by attaching the cooling fin to a part of this piping [at least].

[Claim 3] It is the single member which supports 2 hydraulic pumps in the parallel status. the aforementioned pin center, large section -- the [the above 1st and] -- in the aforementioned housing one side attachment wall -- the [the above 1st and] -- opening which can insert in 2 hydraulic pumps forms -- having -- the above -- a single pin center, large section and single housing opening of this housing -- the [the above 1st and] -- the pin center, large section of this ** 1 that supported 2 hydraulic pumps -- liquid -- so that it may be blockaded densely it connects in one -- having -- a single unit -- constituting -- **** -- the above -- into a single pin center, large section The 1st oilway of the couple which the end section is open for free passage to the 1st aforementioned hydraulic pump, and the other end carries out opening to the method of outside, and forms the end connection with the 1st oil pressure line of the aforementioned couple, The 2nd oilway of the couple which the end section is open for free passage to the 2nd aforementioned hydraulic pump, and the other end carries out opening to the method of outside, and forms the end connection with the 2nd line of the aforementioned couple, The oilway for charge by which the inhalation port for charge where the aforementioned oil tank is open for free passage, and the end section serves as the inlet of the aforementioned supply oil is formed, and the other end was opened for free passage by each of the 1st oilway of the aforementioned couple and the 2nd oilway of the aforementioned couple through the check valve is formed. Furthermore, the charge pump which 2 run pump unit sucks up the reservoir oil in the aforementioned oil tank, and carries out the regurgitation to the aforementioned inhalation port for charge, The pressure regulation line which forms the issue port of the drain oil with which the end section is connected to the aforementioned oilway for charge through a relief valve, and the other end is discharged from the aforementioned relief valve, 2 run pump unit according to claim 2 characterized by the aforementioned charge pump constituting a part of aforementioned oil-circuit device while it has the pipe which connects the other end and the oil tank of the aforementioned pressure regulation line and this pipe constitutes the aforementioned piping.

[Claim 4] It has 2 pin-center, large section. the aforementioned pin center, large section -- the [the above 1st and] -- the [the 1st which supports 2 hydraulic pumps, respectively, and] -- in the aforementioned housing it faces mutually -- on the other hand -- reaching -- the side attachment wall of another side -- respectively -- the [the 1st and] -- the 1st and 2nd opening which can insert in 2 hydraulic pumps forms -- having -- the [the above 1st and] -- 2 pin-center, large section and the aforementioned housing the 1st and 2nd opening of the aforementioned housing -- respectively -- the [the above 1st and] -- the [the 1st which supported 2 hydraulic

pumps, and] -- 2 pin-center, large section -- liquid -- so that it may be blockaded densely It is connected in one and the single unit is constituted. into the aforementioned 1st pin center, large section The end section is open for free passage to the 1st aforementioned hydraulic pump, and the 1st oilway of the couple in which the other end carries out opening to the method of outside, and forms the end connection with the 1st oil pressure line of the aforementioned couple is formed. into the aforementioned 2nd pin center, large section The end section is open for free passage to the 2nd aforementioned hydraulic pump, and the 2nd oilway of the couple in which the other end carries out opening to the method of outside, and forms the end connection with the 2nd line of the aforementioned couple is formed. the [furthermore, / the above 1st and] -- either of the 2 pin-center, large sections -- to one side The inhalation port for charge where the aforementioned oil tank is open for free passage, and the end section serves as the inlet of the aforementioned supply oil is formed, and the oilway for charge by which the other end was opened for free passage by each of the 1st oilway of the aforementioned couple and the 2nd oilway of the aforementioned couple through the check valve is formed. further 2 run pump unit The charge pump which sucks up the reservoir oil in the aforementioned oil tank, and carries out the regurgitation to the aforementioned inhalation port for charge, The pressure regulation line which forms the issue port of the drain oil with which the end section is connected to the aforementioned oilway for charge through a relief valve, and the other end is discharged from the aforementioned relief valve, 2 run pump unit according to claim 2 characterized by the aforementioned charge pump constituting a part of aforementioned oil-circuit device while it has the pipe which connects the other end and the oil tank of the aforementioned pressure regulation line and this pipe constitutes the aforementioned piping.

[Claim 5] It is 2 run pump unit according to claim 3 or 4 which the aforementioned single unit is further equipped with the reserve tank by which link support was carried out, and the aforementioned housing and oil circulation of this reserve tank are enabled through an oil circulation way, is constituted so that an oil tank may be formed with this housing, and is characterized by the aforementioned inhalation port for charge being opened for free passage by the aforementioned reserve tank through an oil supply route.

[Claim 6] 2 run pump unit according to claim 5 characterized by attaching the cooling fin to the aforementioned oil supply route and the oil free passage way.

[Claim 7] the [the above 1st and] -- 2 run pump unit according to claim 5 or 6 characterized by connecting with this single unit, and arranging the aforementioned oil circulation way and the oil supply route so that the aforementioned clearance may be crossed so that the cooling fan which carries out a synchronous drive with 2 hydraulic pumps may prepare near [single unit] the above and, as for a **** cage and the aforementioned reserve tank, the clearance where the cooling wind from the aforementioned cooling fan is introduced between the aforementioned single units may consist

[Claim 8] 2 run pump unit according to claim 7 characterized by having the baffle plate for leading the cooling wind from the aforementioned cooling fan to the aforementioned clearance.

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TECHNICAL FIELD

[The technical field to which invention belongs] the pump unit by which this invention is used for the vehicle with which it comes to connect the 1st and 2nd hydraulic motors with a drive-pulley ring on either side, respectively -- it is -- the [the above 1st and] -- it is related with the pump unit equipped with the 1st which has two inlets with 2 hydraulic motors, respectively, and 2nd hydraulic motors

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PRIOR ART

[Description of the Prior Art] In the vehicle which makes it come, respectively to connect the 1st and 2nd hydraulic motors with a drive-pulley ring on either side the [the above 1st and] -- the 1st and 2nd hydraulic pumps connected with 2 hydraulic motors with the 1st oil pressure line of a couple, and the 2nd oil pressure line of a couple, respectively -- having -- this -- the [the 1st and] -- by operating inhalation / regurgitation oil quantity of 2 hydraulic pumps the [the above 1st and] -- the output of 2 hydraulic motors is changed, and it is well-known to constitute so that the rotational speed and the hand of cut of a drive-pulley ring on either side can be controlled by this as indicated by for example, the U.S. patent official report of No. 4920733

[0003] However, there were various un-arranging -- piping for hydraulic-oil supply to the 1st oil pressure line of the aforementioned couple and the 2nd oil pressure line of a couple becomes complicated -- from the oil tank which the 1st hydraulic pump which has two incomes with the 1st aforementioned hydraulic motor, and the 2nd hydraulic pump which has two incomes with the 2nd aforementioned hydraulic motor are divided into the aforementioned U.S. patent official report in the vehicle of a publication, therefore stores HST hydraulic oil. Furthermore, the temperature of HST hydraulic oil rises with a load from the exterior. Although the temperature rise of ** or ***** brought un-arranging, such as a fall (fall of an axle rotational frequency) of volume efficiency, and a fall of endurance, the thing given in this official report was what is not taken into consideration about temperature suppression of HST hydraulic oil.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to the 2 run pump unit concerning this invention, it is 2 run pump unit used for the vehicle with which it comes to connect the 1st and 2nd hydraulic motors with a drive-pulley ring on either side, respectively. the [the above 1st and] -- the [the 1st hydraulic pump connected with 2 hydraulic motors with the 1st oil pressure line of a couple, and the 2nd oil pressure line of a couple, respectively, and] -- with 2 hydraulic pumps the [the 1st aforementioned hydraulic pump and] -- the [the pin center, large section which supports 2 hydraulic pumps, and / the 1st aforementioned hydraulic pump and], while 2 hydraulic pumps are held. An oil is picked out from housing used as an oil tank, and the aforementioned oil tank, and it has the oil-circuit device again returned in this oil tank. this oil-circuit device Since it constituted so that the oil to circulate could be cooled, the temperature rise of the reservoir oil in an oil tank can be stopped, and, thereby, aggravation of the operation luminous efficacy of HST by the temperature rise of a hydraulic oil can be prevented.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] It is 2 run pump unit used for the vehicle with which this invention is made in view of the aforementioned conventional technique, and it comes to connect the 1st and 2nd hydraulic motors with a drive-pulley ring on either side, respectively, and sets it as one purpose to offer 2 run pump unit which can stop effectively the temperature rise of the hydraulic oil supplied to the oil pressure line of the couple between a hydraulic motor and a hydraulic pump.

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MEANS

[Means for Solving the Problem] this invention is 2 run pump unit used for the vehicle with which it comes to connect the 1st and 2nd hydraulic motors with a drive-pulley ring on either side, respectively, in order to attain the aforementioned purpose. the [the above 1st and] -- the [the 1st hydraulic pump connected with 2 hydraulic motors with the 1st oil pressure line of a couple, and the 2nd oil pressure line of a couple, respectively, and] -- with 2 hydraulic pumps the [the 1st aforementioned hydraulic pump and] -- the [the pin center, large section which supports 2 hydraulic pumps, and / the 1st aforementioned hydraulic pump and], while 2 hydraulic pumps are held An oil is picked out from housing used as an oil tank, and the aforementioned oil tank, it has the oil-circuit device again returned in this oil tank, and this oil-circuit device offers 2 run pump unit constituted so that the oil to circulate could be cooled.

[0006] Preferably, the aforementioned oil-circuit device shall have the circulation line by which the end section was opened for free passage in the aforementioned oil tank, and the other end was again opened for free passage in the oil tank and by which at least the part was considered as piping, and the cooling fin shall be attached to a part of this piping [at least].

[0007] In the mode of 1 the aforementioned pin center, large section It is the single member which supports 2 hydraulic pumps in the parallel status. the [the above 1st and] -- in the aforementioned housing one side attachment wall -- the [the above 1st and] -- opening which can insert in 2 hydraulic pumps forms -- having -- the above -- a single pin center, large section and single housing opening of this housing -- the [the above 1st and] -- the pin center, large section of this ** 1 that supported 2 hydraulic pumps -- liquid -- so that it may be blockaded densely it connects in one -- having -- a single unit -- constituting -- **** -- the above -- into a single pin center, large section The 1st oilway of the couple which the end section is open for free passage to the 1st aforementioned hydraulic pump, and the other end carries out opening to the method of outside, and forms the end connection with the 1st oil pressure line of the aforementioned couple, The 2nd oilway of the couple which the end section is open for free passage to the 2nd aforementioned hydraulic pump, and the other end carries out opening to the method of outside, and forms the end connection with the 2nd line of the aforementioned couple, The oilway for charge by which the inhalation port for charge where the aforementioned oil tank is open for free passage, and the end section serves as the inlet of the aforementioned supply oil is formed, and the other end was opened for free passage by each of the 1st oilway of the aforementioned couple and the 2nd oilway of the aforementioned couple through the check valve is formed. Furthermore, the charge pump which 2 run pump unit sucks up the reservoir oil in the aforementioned oil tank, and carries out the regurgitation to the aforementioned inhalation port for charge, The pressure regulation line which forms the issue port of the drain oil with which the end section is connected to the aforementioned oilway for charge through a relief valve, and the other end is discharged from the aforementioned relief valve, While it has the pipe which connects the other end and the oil tank of the aforementioned pressure regulation line and this pipe constitutes the aforementioned piping, the aforementioned charge pump shall constitute a part of aforementioned oil-circuit device.

[0008] It has 2 pin-center, large section. other modes -- setting -- the aforementioned pin center, large section -- the [the above 1st and] -- the [the 1st which supports 2 hydraulic pumps, respectively, and] -- in the aforementioned housing it faces mutually -- on the other hand -- reaching -- the side attachment wall of another side -- respectively -- the [the 1st and] -- the 1st and 2nd opening which can insert in 2 hydraulic pumps forms -- having -- the [the above 1st and] -- 2 pin-center, large section and the aforementioned housing the 1st and 2nd opening of the aforementioned housing -- respectively -- the [the above 1st and] -- the [the 1st which supported 2 hydraulic pumps, and] -- 2 pin-center, large section -- liquid -- so that it may be blockaded densely

It is connected in one and the single unit is constituted. into the aforementioned 1st pin center, large section The end section is open for free passage to the 1st aforementioned hydraulic pump, and the 1st oilway of the couple in which the other end carries out opening to the method of outside, and forms the end connection with the 1st oil pressure line of the aforementioned couple is formed. into the aforementioned 2nd pin center, large section The end section is open for free passage to the 2nd aforementioned hydraulic pump, and the 2nd oilway of the couple in which the other end carries out opening to the method of outside, and forms the end connection with the 2nd line of the aforementioned couple is formed. the [furthermore, / the above 1st and] -- either of the 2 pin-center, large sections -- to one side The inhalation port for charge where the aforementioned oil tank is open for free passage, and the end section serves as the inlet of the aforementioned supply oil is formed, and the oilway for charge by which the other end was opened for free passage by each of the 1st oilway of the aforementioned couple and the 2nd oilway of the aforementioned couple through the check valve is formed. further 2 run pump unit The charge pump which sucks up the reservoir oil in the aforementioned oil tank, and carries out the regurgitation to the aforementioned inhalation port for charge, The pressure regulation line which forms the issue port of the drain oil with which the end section is connected to the aforementioned oilway for charge through a relief valve, and the other end is discharged from the aforementioned relief valve; While it has the pipe which connects the other end and the oil tank of the aforementioned pressure regulation line and this pipe constitutes the aforementioned piping, the aforementioned charge pump shall constitute a part of aforementioned oil-circuit device.

[0009] The aforementioned single unit shall be preferably equipped further with the reserve tank by which link support was carried out, and the aforementioned housing and oil circulation of this reserve tank shall be enabled through an oil circulation way, it shall be constituted so that an oil tank may be formed with this housing, and the aforementioned inhalation port for charge shall be opened for free passage by the aforementioned reserve tank through an oil supply route.

[0010] As for the aforementioned oil supply route and an oil free passage way, a cooling fin shall be attached more preferably.

[0011] the [moreover, / the above 1st and] -- it shall connect with this single unit so that the cooling fan which carries out a synchronous drive with 2 hydraulic pumps may be formed near [single unit] the above and, as for the aforementioned reserve tank, the clearance where the cooling wind from the aforementioned cooling fan is introduced between the aforementioned single units may consist, and the aforementioned oil circulation way and an oil supply route shall be arranged so that the aforementioned clearance may be crossed

[0012] Preferably, it shall have the baffle plate for leading the cooling wind from the aforementioned cooling fan to the aforementioned clearance.

[0013]

[Embodiments of the Invention] It explains, referring to an accompanying drawing below to gestalt 1. of operation about the gestalt of desirable operation of the 1st of the pump unit concerning this invention. Drawing 1 is a hydraulic-circuit view of the vehicle with which the pump unit 1 concerning the gestalt of this operation is applied, and drawing 2 is a vertical section side elevation near [aforementioned] a pump unit. Moreover, they are a drawing 3 - view 6 and A[respectively in drawing 2]-A line, a B-B line, a C-C line, and D-D-lines cross section.

[0014] As shown in drawing 1 - view 3 , the aforementioned pump unit 1 It is what is used for the vehicle with which it comes to connect the 1st and 2nd hydraulic motors 120a and 120b with the drive-pulley rings 130a and 130b on either side, respectively. the [the above 1st and] -- the [1st hydraulic-pump 10a connected with the 2 hydraulic motors 120a and 120b with the oil pressure lines 140a and 140b of the 1st and 2nd couples, respectively, and] -- it has 2 hydraulic-pump 10b and the housing 20 which holds these hydraulic pumps 10a and 10b

[0015] In addition, the mode by which each hydraulic motor is connected to each drive-pulley ring in operation through a proper power transmission device when each hydraulic motor is directly linked with each drive-pulley ring, respectively as coming to connect the 1st and 2nd hydraulic motors 120a and 120b with the drive-pulley rings 130a and 130b on either side, respectively is also contained. Moreover, in drawing 1 , a sign 100 is a driving source, a sign 110 is a cooling fan, and a sign 160 is a VCF.

[0016] it is shown in the drawing 2 and the drawing 3 -- as -- the [the aforementioned 1st hydraulic-pump 10a and] -- 2 hydraulic-pump 10b the [1st pumping-axes 11a prolonged to the perpendicular direction which is

used as the good change product type axial piston pump, and has been mutually arranged in parallel with the vehicle cross direction in the aforementioned housing 20, respectively, and] -- with 2 pumping-axes 11b the [1st piston unit 12a which performs reciprocating motion in connection with rotation of this pumping axes, and] -- with 2 piston unit 12b the [1st cylinder block 13a which supports this piston unit free / reciprocation /, and] -- with a tilt angle with 2 cylinder-block 13b the [to which the stroke length of the aforementioned piston unit is regulated and inhalation / regurgitation oil quantity of this piston unit are changed] -- the [1 movable cam-plate 14a and] -- the [1st control-axis 15a which operates 2 movable cam-plate 14b and the tilt angle of this movable cam plate, and] -- it has 2 control-axis 15b

[0017] in addition, the gestalt of this operation -- setting -- a pump unit 1 -- the [the 1st and] -- that by which this invention is restricted to ** or ***** although it considered as the vertical type (vertical type) which is arranged and becomes so that the 2 pumping axes 11a and 11b might be prolonged perpendicularly -- it is not -- the [the 1st and] -- naturally it is also possible to consider as the level type (horizontal type) which is arranged and becomes so that the 2 pumping axes 11a and 11b may

[0018] it is well shown in drawing 3 -- it is carried out -- as -- the gestalt of this operation -- setting -- the [the above 1st and] -- the cradle type movable cam plate is used as 2 movable cam plates 14a and 14b

[0019] it is shown in the drawing 2 and the drawing 6 -- as -- the [the aforementioned 1st control-axis 15a and] -- as for 2 control-axis 15b, an inner direction edge rushes in into housing 20, respectively -- having -- arms 16a and 16b -- minding -- the -- the [1 movable cam-plate 14a and] -- it connects with 2 movable cam-plate 14b the [and] -- the [1 control-axis 15a and] -- the way edge is prolonged toward the longitudinal direction back of a vehicle outside 2 control-axis 15b

[0020] the [in addition, / the aforementioned 1st control-axis 15a and] -- it is also possible to arrange 2 control-axis 15b along the vehicle cross direction so that a way edge may estrange mutually each outside the [this 1st control-axis 15a and] -- by arranging 2 control-axis 15b in this way When installing this pump unit 1 in the car body which has the control lever of a push pull format the [the aforementioned 1st control-axis 15a and] -- the rotation-axis core of 2 control-axis 15b -- the rotation supporting point of the aforementioned control lever, and parallel -- it can arrange -- the [therefore,] -- the [1 control-axis 15a and] -- the structure of a link mechanism of connecting 2 control-axis 15b and the aforementioned control lever can be made to simplify a ** or ** case -- setting -- further -- desirable -- the [the aforementioned 1st control-axis 15a and] -- 2 control-axis 15b can be located in a **** position about a vehicle longitudinal direction thus, the thing to constitute -- the [the aforementioned 1st control-axis 15a and] -- the vehicle longitudinal direction position of 2 control-axis 15b and the aforementioned control lever can be doubled, and the structure of the aforementioned link mechanism can be made to simplify more

[0021] the aforementioned pump unit 1 -- further -- the [the above 1st and] -- it holds in the aforementioned housing 20 with the common pin center, large section 30 which supports the 2 hydraulic pumps 10a and 10b -- having -- the [the above 1st and] -- it has the power transmission device 40 which connects 2 hydraulic-pump shafts 11a and 11b in operation

[0022] having the aforementioned power transmission device 40 -- the [a driving source, the 1st, or] -- the 2 pumping axes 11a and 11b can only connect one side (it sets in the gestalt of this operation and is 1st pumping-axes 11a) either, both pumping axes 11a and 11b can be made to be able to drive simultaneously, and, thereby, the transmission structure to this pump unit 1 can be made to simplify from a driving source In the gestalt of this operation, the gearing gear which comes to have 2nd gearing 40b which is supported by the relative rotation impotentia at the 1st gearing 40a [which is supported by the relative rotation impotentia at the lower part side of 1st pumping-axes 11a] and lower part side of the aforementioned 2nd pumping-axes 11b, and gears with the aforementioned 1st gearing 40a as the aforementioned power transmission device 40 is used (refer to [the drawing 3 and] the drawing 4). In addition, it is also possible to replace with this gearing gear and to use proper power transmission devices, such as a chain and a belt.

[0023] the aforementioned housing 20 is shown in the drawing 2 and the drawing 3 -- as -- the [the 1st and] -- it has the 1st housing 21 which holds the 2 hydraulic pumps 10a and 10b, and the 2nd housing 22 which holds the aforementioned power transmission device 40

[0024] The 1st aforementioned housing 21 is the longitudinal direction one side (in the gestalt of this operation, it is a lower part side) of the aforementioned pumping axes 11a and 11b, as well shown in the drawing 2 and the drawing 3 . hereafter, it allots for calling it a lower part side -- having -- the [the above 1st and] -- the

bearing which can insert in the lower part side edge section of the 2 pumping axes 11a and 11b -- with 1st side-attachment-wall section 21a in which the hole was formed Longitudinal direction other side of the periphery section of this 1st side-attachment-wall section 21a to the aforementioned pumping axes 11a and 11b (in the gestalt of this operation) it considers as the enclosed type which has peripheral-wall section 21b prolonged to be an upper part side and call it an upper part side hereafter -- having -- **** -- the end face by the side of the upper part -- the [1st hydraulic-pump 10a and] -- opening which can insert 2 hydraulic-pump 10b is formed and the aforementioned opening of this 1st housing 21 -- the aforementioned pin center, large section 30 -- -- it is blockaded densely That is, in the gestalt of this operation, the pin center, large section 30 constitutes a part of 1st housing 21.

[0025] the 2nd aforementioned housing 22 is arranged on a lower part side -- having -- the bearing which can insert in the lower part side edge section of 1st pumping-axes 11a -- the [a hole and] -- with lower part side-attachment-wall 22a in which bearing which carries out bearing support of the lower part side edge section of 2 pumping-axes 11b was formed It considers as the enclosed type which has peripheral-wall section 22b which extended in the upper part from the periphery section of this lower part side-attachment-wall 22a, and opening which can insert the aforementioned power transmission device 40 is formed in the end face by the side of the upper part.

[0026] this 2nd housing 22 -- the aforementioned opening -- 1st side-attachment-wall section 21a of the 1st aforementioned housing 21 -- liquid -- it connects with the 1st aforementioned housing 21, and the hold space of the aforementioned power transmission device 40 is formed in the bottom of having two incomes with 1st side-attachment-wall 21a of the 1st aforementioned housing 21 so that it may be blockaded densely

[0027] The aforementioned housing 20 is constituted as mentioned above, and is functioning as a bridge wall to which 1st side-attachment-wall section 21a of the 1st housing 21 demarcates housing hold space in a hydraulic-pump hold room and a power-transmission-device hold room. Thus, by demarcating a hydraulic-pump hold room and a power-transmission-device hold room by the bridge wall, the foreign matters generated with the aforementioned power transmission device 40, such as iron powder, enter a hydraulic-pump hold room, and can prevent effectively damaging the piston units 12a and 12b and the cylinder blocks 13a and 13b. the

[furthermore, / the 1st which penetrates bridge-wall 21a, and] -- if the seal ring is installed in the periphery side of the 2 pumping axes 11a and 11b, irruption of the aforementioned foreign matter can be prevented certainly

[0028] in addition, the seal means by which the insertion fraction of each shafts 11a, 15a, and 15b in the aforementioned housing 20 is proper -- liquid -- the seal is carried out densely and this housing 20 can be used now as an oil tank

[0029] furthermore, the oil circulation which opens a hydraulic-pump hold room and a power-transmission-device hold room for free passage preferably to the aforementioned 1st side-attachment-wall section 21a which functions as a bridge wall -- a hole (not shown) -- forming -- this oil circulation -- the VCF which prevents mixing of a foreign matter etc. to a hole can be prepared Thus, without supplying the lubricating oil for power transmission devices separately, if an oil style through-hole is formed, the lubrication of the power transmission device 40 can be carried out from reservoir oil in housing, and a low-cost-izing and maintenance disposition top can be planned.

[0030] furthermore, the gestalt of this operation -- setting -- above -- the [the above 1st and], since the 2 movable cam plates 14a and 14b are considered as the cradle type As shown in drawing 3, to the field which faces the hydraulic pumps 10a and 10b of the aforementioned bridge-wall 21a If the concave radii side 24 corresponding to the convex radii side 19 of the side (tooth-back side) estranged in the piston units 12a and 12b in the aforementioned movable cam plates 14a and 14b is formed It can show around according to this concave radii side 24 free [sliding of the convex radii side 16 of the movable cam plates 14a and 14b], and positioning by which these movable cam plates 14a and 14b were stabilized can be performed.

[0031] In addition, in the gestalt of this operation, although 1st side-attachment-wall section 21a of the 1st housing 21 was used as a bridge wall, as long as the aforementioned operation is achieved, various gestalt is applicable [it replaces with this, and]. For example, it is also possible to constitute so that housing may be made into a simple single enclosed type and a bridge wall may be separately attached in the halfway fraction of the enclosed type of this ** 1.

[0032] Next, the pin center, large section 30 is explained. E-E-lines cross section in drawing 5 is shown in

drawing 7 . As well shown in the drawing 5 and the drawing 7 , 1st oilway 31a of the couple in which the end section opens for free passage to the aforementioned 1st piston unit, and the other end carries out opening to the method of outside is formed in this pin center,large section 30. Other end opening of 1st oilway 31a of this couple forms the 1st inhalation / regurgitation port 32a of the couple used as the end connection with 1st oil pressure line 140a of the aforementioned couple (refer to the drawing 1).

[0033] Furthermore, as well shown in drawing 5 , 2nd oilway 31b of the couple in which the end section opens for free passage to the aforementioned 2nd piston unit, and the other end carries out opening to the method of outside is formed in the aforementioned pin center,large section 30. Other end opening of 2nd oilway 31b of this couple forms the 2nd inhalation / regurgitation port 32b of the couple used as the end connection with 2nd oil pressure line 140b of the aforementioned couple (refer to the drawing 1).

[0034] Thus, easy-ization of the piping connection work between the hydraulic pumps 10a and 10b and hydraulic-motor 120a, and 120b can be attained by forming all of the 1st inhalation / regurgitation port 32a of the couple used as the end connection with 1st oil pressure line 140a of a couple, and 2nd oil pressure line 140b of a couple, and the 2nd inhalation / regurgitation port 32b of a couple in the common pin center,large section 30. In addition, in the gestalt of this operation, on the side face in which the common pin center,large section 30 counters mutually, although the 1st inhalation / regurgitation port 32a of a couple, and the 2nd inhalation / regurgitation port 32b of a couple were prepared, respectively It can replace with this, aforementioned inhalation / regurgitation ports 32a and 32b can also be formed in the same side face of the pin center,large section 30, and, thereby, further easy-ization of the aforementioned piping connection work can be attained.

[0035] Into the aforementioned pin center,large section 30, further, as shown in drawing 2 , the drawing 4 , and the drawing 5 The oilway for charge 33 which forms the inhalation port for charge 34 where the end section carries out opening to the method of outside, and serves as the inlet of a supply oil, and the other end opens for free passage through check valves 61a, 61b, 61c, and 61d to each of 1st oilway 31a of the aforementioned couple and 2nd oilway 31b of the aforementioned couple is formed.

[0036] The upper part edge of the aforementioned 1st pumping-axes 11a is made to extend upwards further from the pin center,large section 30, and this extension section is made to support the charge pump 50 in the gestalt of this operation, as well shown in the drawing 2 and the drawing 3 . And cartridge type VCF 160 is formed in the top of this charge pump free [attachment and detachment], and an oil inhales through aforementioned VCF 160 to the inhalation opening 55 of the charge pump 50. In addition, this VCF 160 can also be prepared in the discharge side of the charge pump 50.

[0037] The end section of the pressure regulation line 53 in which the relief valve 52 was inserted is connected to the aforementioned oilway for charge 33, and it is constituted so that the oil pressure of this oilway for charge 33 can be set up by this relief valve 52 (refer to [the drawing 1 and] the drawing 2). Opening of the other end of the aforementioned pressure regulation line is carried out to the method of outside, and it forms the issue port 54 which discharges the drain oil from the aforementioned relief valve 52.

[0038] In addition, in the gestalt of this operation, although formed in the charge pump case 59 in which the aforementioned pressure regulation line 53 was attached on the top of the pin center,large section 30, this invention is not restricted to ** or *****. That is, it is also possible to form the aforementioned pressure regulation line 53 in the pin center,large section 30. In addition, the sign 51 in the drawing 2 and the drawing 4 is the delivery of a charge pump. Moreover, a sign 56 is the inhalation port opened for free passage by the inhalation opening 55 of the charge pump 50 through VCF 160.

[0039] As mentioned above, the other end of the aforementioned oilway for charge 33 Are open for free passage through 1st oilway 31a of a couple, and each and the check valves 61a, 61b, 61c, and 61d of 2nd oilway 31b of a couple. A pressure oil is supplied to the low-tension side of the both sides of 1st oil pressure line 140a of a couple, and 2nd oil pressure line 140b of a couple from the common oilway for charge 33, and a pressure oil flows out and bends for the reverse, and it is constituted like.

[0040] furthermore, 1st oilway 31a of a couple -- at least -- either -- 2nd oilway 31b of between one side and the oilways for charge 33, and a couple -- at least -- either -- one side, the oilway for charge 33, and in between, the bypass lines 62a and 62b equipped with the throttle valve are formed (refer to [the drawing 1 and] the drawing 5)

[0041] These bypass lines 62a and 62b are for being stabilized and securing the neutral status of hydraulic pumps 10a and 10b. That is, if the movable cam plates 14a and 14b of hydraulic pumps 10a and 10b incline

from a center valve position, a pressure differential will arise between 1st oil pressure line 140a of a couple, and/or between 2nd oil pressure line 140b of a couple, and hydraulic motors 130a and 130b will rotate by this. Therefore, when the center valve position of the aforementioned movable cam plates 14a and 14b has shifted from the setting position according to the manufacture error etc., hydraulic motors 130a and 130b will rotate against a user's mind. On the other hand, if bypass lines 62a and 62b are formed, since a pressure oil will leak from the oil pressure lines 140a and 140b through these pie pass lines 62a and 62b as mentioned above When the movable cam plates 14a and 14b should be in a center valve position, even if it is the case where it inclines according to a manufacture error etc. The pressure differential produced between 1st oil pressure line 140a of a couple and/or between 2nd oil pressure line 140b of a couple can be stopped effectively, and the rotation contrary to the mind of hydraulic motors 120a and 120b can be prevented effectively.

[0042] In addition, since a leakage of the pressure oil from the oil pressure lines 140a and 140b of the couple by bypass lines 62a and 62b is not desirable from the point of the efficiency of transmission between hydraulic pumps 10a and 10b and the hydraulic motors 120a and 120b, as for this bypass line, it is desirable to reach on the other hand and to prepare only between [one] 2nd oilway 31b of a couple of 1st oilway 31a of the oilway for charge 33 and a couple.

[0043] Furthermore, the open means 62 is formed in the aforementioned check valves 61a, 61b, 61c, and 61d, respectively, and emergency may be made to be able to open compulsorily between the 1st oilway 31 of a couple, and between 2nd oilway 31b of a couple for free passage preferably, as shown in drawing 5. By establishing the ** or ***** means 62, when there is the need of moving a vehicle compulsorily by human power etc. in the time of failure of a driving source 100 and the hydraulic pumps 10a and 10b etc. (a wheel being rotated compulsorily), it is enabled to move a vehicle easily. That is, if the wheel with which hydraulic motors 120a and 120b were connected after 1st oilway 31a of a couple and/or 2nd oilway 31b of a couple had closed is rotated compulsorily, by rotation of these hydraulic motors 120a and 120b, a pressure differential will arise among 1st oil pressure line 31a of a couple, and among 2nd oil pressure line 31b of a couple, and it will become difficult to move a vehicle (for a wheel to be rotated). On the other hand, if the aforementioned open means is established, since it can make all the check valves 61a, 61b, 61c, and 61d able to open wide mechanically compulsorily and between 1st oilway 31a of the aforementioned couple and between 2nd oilway 31b of a couple can be made to open for free passage, it is enabled to perform a compulsory move of a vehicle easily.

[0044] In addition, as shown in drawing 5, in order to operate this open means 63 by arranging all the open meanses 63 to the same side side of the pin center, large section 30, the link mechanism connected with this open means can be constituted easily.

[0045] as mentioned above, the pump unit 1 concerning the gestalt of this operation -- the [the above 1st and] - it has the 2 hydraulic pumps 10a and 10b, the aforementioned pin center, large section 30, and the aforementioned housing 20, and these each part material is connected in one, and constitutes single unit 1a therefore, only attaching unit 1a of this ** 1 in a vehicle -- the [1st hydraulic-pump 10a and] -- since the both sides of 2 hydraulic-pump 10b can be installed in a vehicle, the assembly-operation luminous efficacy of a vehicle can also be raised

[0046] Furthermore, the pump unit 1 concerning the gestalt of this operation equips the aforementioned single unit 1a with the reserve tank 150 by which link support was carried out, as shown in drawing 2 - view 4. The attachment rib 151 is formed in the side face of right and left of a reserve tank 150, and the aforementioned single unit 1a is made to carry out link support of the reserve tank 150 through the attachment member 200 connected with this attachment rib 151 in the gestalt of this operation. Through the proper oil supply routes 170, such as a pipe, it is open for free passage free [the aforementioned housing 20 and oil circulation], and this reserve tank 150 functions as an oil tank with this housing 20, as shown in the drawing 2 and the drawing 6.

[0047] Preferably, the top of a reserve tank 150 can be located more nearly up than the top of housing 20, thereby, the inside of this housing 20 is completely filled with an oil, and air mixing into this oil can be prevented effectively. In addition, to the capacity change by the temperature change of the oil in housing 20, it can adjust by the reserve tank 150 currently opened for free passage by this housing.

[0048] The aforementioned oil tank is opened for free passage by the aforementioned inhalation port for charge 34. In the gestalt of this operation, it is constituted so that it may be sucked up with the charge pump 50 through the oil supply route 180 from the reserve tank 150 which constitutes a part of oil tank and an oil may be

supplied to the inhalation port for charge 34 through the pressure regulation line 53 (references, such as the drawing 1 and the drawing 2).

[0049] The end section of the piping for cooling 210 is connected to the issue port 54 which, on the other hand, discharges the drain oil of a relief valve 52 inserted in the aforementioned pressure regulation line 53. The other end of this piping for cooling 210 is opened for free passage by the reserve tank 150 which constitutes a part of oil tank. As shown in drawing 2 , at least a part can be estranged from the aforementioned single unit 1a and the reserve tank 150, and can be prolonged in the open air, and the oil which flows the inside of this piping for cooling 210 can carry out air cooling of this piping for cooling 210. Preferably, a cooling fin can be attached to the periphery side of this piping for cooling 210, and, thereby, enhancement in the cooling luminous efficacy by the increase in a heat sinking plane product can be aimed at. In addition, the aforementioned piping for cooling 210 can be made to connect with the reserve tank 150 or single unit 1a by the proper bracing means.

[0050] Thus, in the gestalt of this operation, it is inhaled by the inhalation opening 55 of the charge pump 50 through the oil supply route 180, and through the piping for cooling 210 prolonged in the open air, a part of oil breathed out from the delivery 51 of this charge pump 50 is constituted so that it may return in an oil tank. By namely, the part and the piping for cooling 210 of the oil supply route 180 and the pressure regulation line 53 The circulation line by which the end section was opened for free passage by the oil tank and the other end was again opened for free passage by the oil tank is formed. It is constituted so that the oil in an oil tank may be sucked up from the end section of the aforementioned circulation line with the charge pump 50 and it may return in an oil tank from the other end of a circulation line. furthermore, by this The temperature rise of a reservoir oil can be stopped effectively and aggravation of the operation luminous efficacy of a hydraulic pump and a hydraulic motor can be prevented now.

[0051] In addition, in the gestalt of this operation, although it constituted so that the drain oil of a relief valve 52 inserted in the pressure regulation line 53 might be returned to an oil tank through the piping for cooling 210, this is because the cooling luminous efficacy of an oil was taken into consideration. That is, the regurgitation oil from the charge pump 50 serves as the hyperbaric pressure, and the drain oil from a relief valve 52 serves as the elevated temperature by the pressure energy of the aforementioned regurgitation oil. Therefore, when this drain oil is directly returned to an oil tank, there is a possibility that the temperature of the reservoir oil in an oil tank may rise. On the other hand, in the gestalt of this operation, since it constitutes so that the drain oil of the aforementioned relief valve 52 used as the elevated temperature may be returned to an oil tank through the piping for cooling 210, the temperature rise of the reservoir oil in an oil tank can be stopped efficiently.

[0052] Furthermore, preferably, the cooling fan 110 driven in operation by the driving source 100 is formed near the aforementioned single unit 1a and the reserve tank 150, and this reserve tank 150 can be made to be able to connect with this single unit 1a so that the clearance 190 where the cooling wind from the aforementioned cooling fan 110 is introduced between this reserve tank 150 and single unit 1a may consist, and it can constitute so that the aforementioned oil supply route 180 and/or the oil circulation way 170 may cross the aforementioned clearance.

[0053] In this case, preferably, the method of left right-hand side of the aforementioned oil supply route 180 and the oil circulation way 170 can be surrounded with a baffle plate (shroud), and, thereby, the cooling wind from a cooling fan can be efficiently led to the aforementioned clearance 190. In the gestalt of this operation, the attachment member 200 for attaching a reserve tank 150 in the aforementioned single unit 1a is made into a casing configuration (refer to the drawing 8), and it constitutes so that the cooling wind from the aforementioned cooling fan 110 may be efficiently led to the aforementioned clearance by the side attachment wall of this attachment member 200.

[0054] Thus, by constituting, in case the aforementioned oil supply route 180 and the oil circulation way 170 are flowed in addition to cooling of the oil at the time of flowing the aforementioned piping for cooling 210, an oil can be made to be able to cool, and the temperature rise in an oil tank can be stopped more effectively.

[0055] In addition, more preferably, a cooling fin can be prepared also in the periphery side of the aforementioned oil supply route 180 and the aforementioned oil circulation way 170, and, thereby, enhancement in the cooling luminous efficacy by the increase in a heat sinking plane product can be aimed at. Moreover, it is also possible to prepare a cooling fin in reserve-tank 150 self.

[0056] Moreover, the aforementioned reserve tank 150 considers as the translucent product made from a resin, and can make it possible to view an internal storage oil quantity preferably. Furthermore, the top can be

equipped with the lubrication cap 152 who has a degassing device at the aforementioned reserve tank 150.

[0057] Moreover, in the gestalt of this operation, it has the charge pump 50, and although it constituted so that this charge pump 50 might make a circulation line circulate through an oil while it constituted so that a pressure oil might be compulsorily supplied to the aforementioned inhalation port for charge 34, this invention is not restricted to ** or *****. For example, while it constitutes so that an oil may be attracted automatically when the inhalation port for charge 34 is directly connected to the reserve tank 150 through the oil supply route 180 and the oil pressure of the low-tension side line of the oil pressure line of a couple falls from a predetermined value, without having a charge pump, it is also possible to constitute so that it may have separately a pump for making a circulation line circulate through an oil.

[0058] Furthermore, if it constitutes so that the cooling wind from the cooling fan (not shown) or radiator (not shown) for driving sources may be in charge of the aforementioned piping for cooling 210, it will be enabled to cool more efficiently the oil which flows this piping for cooling 210.

[0059] It explains below gestalt 2. of operation, referring to drawing 9 about the gestalt of desirable operation of the 2nd of the pump-unit concerning this invention. Drawing 9 is a vertical section side elevation of pump-unit 1' concerning the gestalt of this operation. As shown in drawing 9, pump-unit 1' concerning the gestalt of this operation reaches 1st hydraulic-pump 10, and let it be the tandem pump unit with which it comes to connect the 2nd hydraulic pump 20 in series. In addition, in the following explanations, also in the gestalt 1 of the aforementioned implementation, a dash is given to the same member or a considerable member at the same sign or the same sign, and the explanation is omitted.

[0060] it is shown in drawing 9 -- as -- aforementioned pump-unit 1' -- the [1st hydraulic-pump 10a and] -- the [common housing 20' which holds 2 hydraulic-pump 10b, and / this 1st hydraulic-pump 10a and] -- the [1st pin center, large section 30a which supports 2 hydraulic-pump 10b, respectively, and] -- it has 2 pin-center, large section 30b

[0061] aforementioned common housing 20' -- the orientation one side (setting in the gestalt of this operation lower part side) of an axis of pumping axes 11a and 11b, and the other side (setting in the gestalt of this operation upper part side) -- respectively -- the [1st hydraulic-pump 10a and] -- the [1st opening 20a' which can insert 2 hydraulic-pump 10b, and] -- 2 opening 20b' is formed

[0062] Furthermore, bridge-wall 20c' is formed in this common housing 20' at a part for the orientation abbreviation center section of a pumping axes, and it is divided by this bridge-wall 20c' in the 1st-pump house hold space and the 2nd-pump house hold space. this bridge-wall 20c' -- the [1st pumping-axes 11a and] -- it has bearing which carries out bearing support of the joining segment of 2 pumping-axes 11b concrete -- the [the transmission orientation back end section (upper-limit section) of 1st pumping-axes 11a, and] -- the bearing which equipped the transmission orientation front end section (soffit section) of 2 pumping-axes 11b with the link member 16 extrapolated by the relative rotation impotentia, and formed this link member 16 in the aforementioned bridge wall -- 20d [of holes] ' is made to support free [relative rotation] In addition, two or more oil circulation way 20e' which opens the 1st-hydraulic pump hold room and the 2nd-hydraulic pump hold room for free passage can be formed in aforementioned bridge-wall 20c'. By forming ** or **** circulation way 20e', the whole housing can be used as an oil tank.

[0063] The aforementioned 1st pin center, large section 30a is connected with this housing 20' so that 1st opening 20a' of the aforementioned housing may be blockaded while it supports 1st hydraulic-pump 10a to a top side. 1st pumping-axes 11a of 1st hydraulic-pump 10a may have comes to drive a cooling fan 110 while the transmission orientation front end section (soffit section) penetrates the aforementioned 1st pin center, large section 30a, has extended caudad and inputs power from this lower part extension section.

[0064] On the other hand, the aforementioned 2nd pin center, large section 30b is connected with this housing 20' so that 2nd opening 20b' [of aforementioned housing 20'] ' may be blockaded while it supports 2nd hydraulic-pump 10b to a inferior-surface-of-tongue side. The transmission orientation back end section (upper-limit section) penetrates the aforementioned 2nd pin center, large section 30b, 2nd pumping-axes 11b of 2nd hydraulic-pump 10b has extended up, and the charge pump 50 is driving it among this upper part extension section.

[0065] As shown in the drawing 1 and the drawing 9, 1st oilway 31a of the couple for the 1st hydraulic pump in which carries out opening to the field (top) which faces this ** piston unit so that the end section may be open for free passage to inhalation/delivery of 1st piston unit 12a, and the other end carries out opening to the

method of outside is formed in the aforementioned 1st pin center, large section 30a. Other end opening of 1st oilway 31a of this couple forms the 1st inhalation / regurgitation port 32a of the couple used as the end connection with 1st oil pressure line 140a of the couple between 1st hydraulic-motor 120a.

[0066] Similarly, as shown in the drawing 1 and the drawing 9, 1st oilway 31b of the couple for the 2nd hydraulic pump in which carries out opening to the field (inferior surface of tongue) which faces this 2nd piston unit so that the end section may be open for free passage to inhalation/delivery of 2nd piston unit 12b, and the other end carries out opening to the method of outside is formed in the aforementioned 2nd pin center, large section 30b. Other end opening of 2nd oilway 31b of this couple forms the 2nd inhalation / regurgitation port 32b of the couple used as the end connection with 2nd oil pressure line 140b of the couple between 2nd hydraulic-motor 120b.

[0067] Furthermore, in the gestalt 1 of the aforementioned implementation, similarly, pump-unit 1' concerning the gestalt of this operation is equipped with the common oilway for charge 33 which the end section carries out opening to a way outside this unit, and forms the inhalation port for charge 34, and the other end opens for free passage to each of the 1st oilway of the aforementioned couple, and the 2nd oilway of the aforementioned couple so that it may be allotted in this pump unit.

[0068] As shown in drawing 9, this oilway for charge 33 While the end section carries out opening to the top of the 2nd pin center, large section, and the aforementioned inhalation port for charge 34 is formed and the other end is open for free passage to 2nd oilway 31b of the aforementioned couple through the aforementioned check valves 61c and 61d 1st punch station 33a formed in this 2nd pin center, large section so that opening might be carried out to the 2nd-hydraulic pump hold room, Pipe section 33b allotted so that the end section might be connected to the other end of this 1st punch station 33a, and the other end might penetrate the 2nd-hydraulic pump hold room, bridge-wall 20c, and the 1st-hydraulic pump hold room and 1st pin center, large section 30a might be reached, It has 2nd punch station 33c formed in the aforementioned 1st pin center, large section 30a so that the end section might be connected to the other end of this pipe section 33b and the other end might be open for free passage to 1st oilway 31a of the aforementioned couple through the aforementioned check valves 61a and 61b. The aforementioned pipe section 33b can make aforementioned bearing wall 20c' penetrate by making aforementioned style through-hole 20e' insert in.

[0069] Furthermore, also in the gestalt 1 of operation, the end section of the pressure regulation line 53 in which the relief valve 52 was inserted similarly is connected to the aforementioned oilway for charge 33, and it is constituted so that the oil pressure of this oilway for charge 33 can be set up by this relief valve 52 (refer to [the drawing 1 and] the drawing 9). And opening of the other end of the aforementioned pressure regulation line 53 is carried out to the method of outside, and it forms the issue port 54 which discharges the drain oil from the aforementioned relief valve 52.

[0070] In the gestalt 1 of the aforementioned implementation, similarly, the piping for cooling 210 is connected to this issue port 54, and it is constituted so that the drain oil discharged from this issue port 54 may be returned to an oil tank through the piping for cooling 210.

[0071] Thus, also in pump-unit 1' concerning the gestalt of this constituted operation, the same effect can be acquired also in the gestalt 1 of the aforementioned implementation.

[0072] in addition, it replaces with aforementioned pipe section 33b', and the end section is connected to the other end of aforementioned 1st punch station 33a', and the other end is connected to the end section of aforementioned 2nd punch station 33c' -- as -- the peripheral-wall section of the common housing 20 -- circulation -- it is also possible to punch a hole

[Translation done.]

* NOTICES *

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2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] Drawing 1 is a hydraulic-circuit view of the vehicle with which the gestalt of the 1st operation was applied where the pump unit concerning this invention is desirable.

[Drawing 2] Drawing 2 is a vertical section side elevation of the pump unit concerning the gestalt of the 1st operation.

[Drawing 3] Drawing 3 is an A-A line cross section in drawing 2 .

[Drawing 4] Drawing 4 is a B-B line cross section in drawing 2 .

[Drawing 5] Drawing 5 is a C-C line cross section in drawing 2 .

[Drawing 6] Drawing 6 is D-D-lines cross section in drawing 2 .

[Drawing 7] Drawing 7 is E-E-lines cross section in drawing 5 .

[Drawing 8] Drawing 8 is a perspective diagram of an attachment member.

[Drawing 9] Drawing 9 is a vertical section side elevation of the gestalt of desirable operation of the 2nd of the pump unit concerning this invention.

[Description of Notations]

1, 1' Pump unit

1a, 1a' Single unit

10a, 10b The 1st hydraulic pump, the 2nd hydraulic pump

11a, 11b The 1st pumping axes, the 2nd pumping axes

20, 20' Housing

30 Pin Center, large Section

30a, 30b The 1st pin center, large section, the 2nd pin center, large section

31a, 32a The 1st oilway of a couple, the 2nd oilway of a couple

32a, 32b The 1st inhalation / regurgitation port, the 2nd inhalation / regurgitation port

33 Charge Oilway

34 Inhalation Port for Charge

50 Charge Pump

52 Relief Valve

53 Pressure Regulation Line

54 Issue Port

56 Inhalation Port

61a, 61b, Check valve

61c, 61d

110 Cooling Fan

120a, 120b The 1st hydraulic motor, the 2nd hydraulic motor

130a, 130b Drive-pulley ring on either side

140a, 140b The 1st oil pressure line, the 2nd oil pressure line

150 Reserve Tank

170 Oil Circulation Way

180 Oil Supply Route

190 Clearance

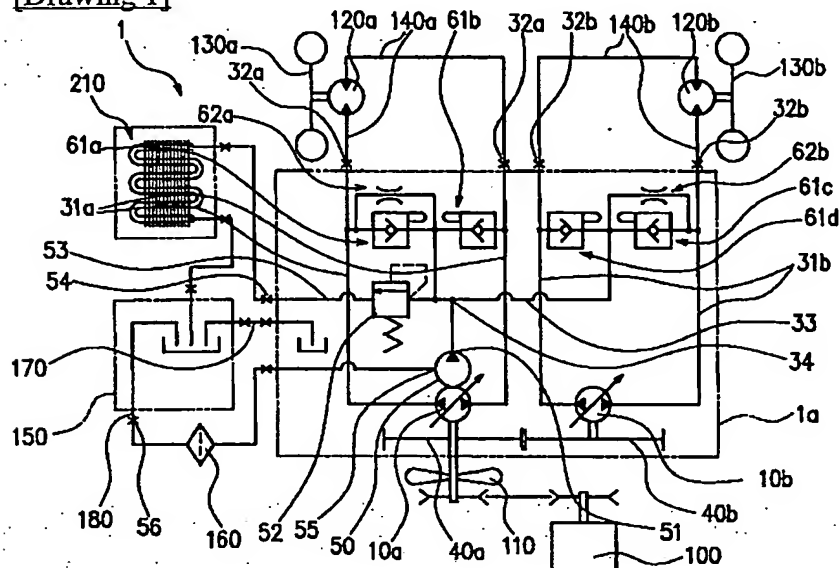
200 Attachment Member

210 Piping for Cooling

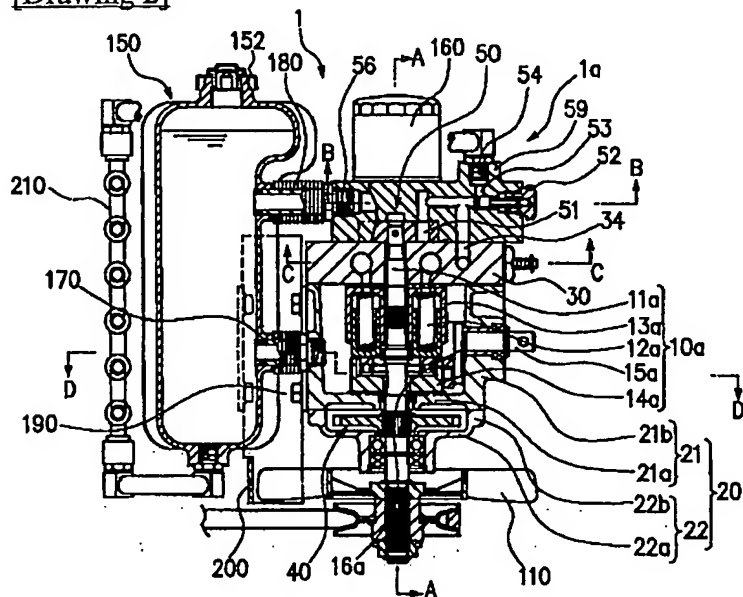
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[Drawing 1]

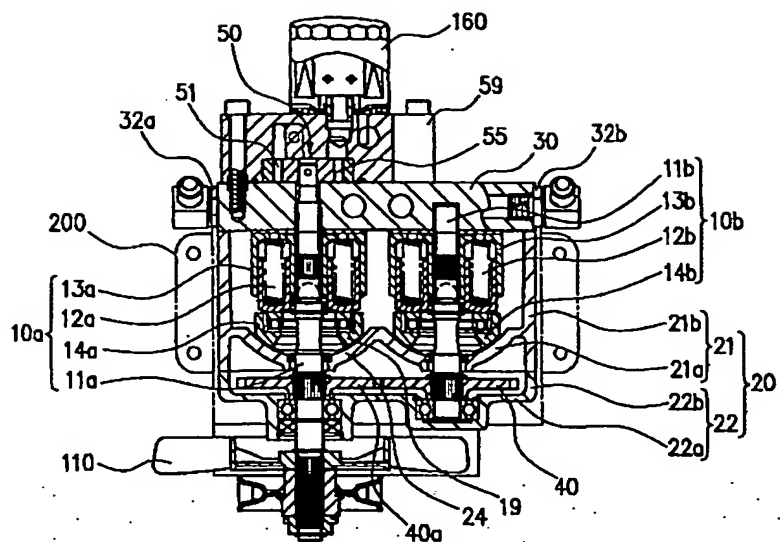


[Drawing 2]

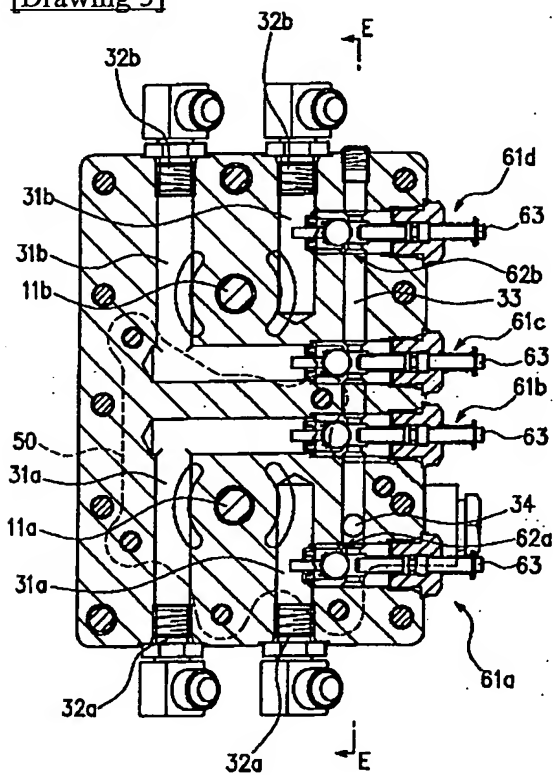


[Drawing 3]

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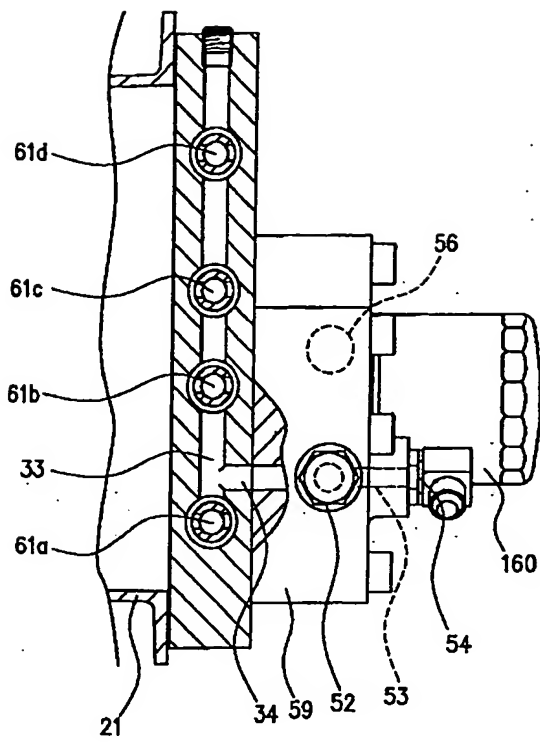


[Drawing 5]

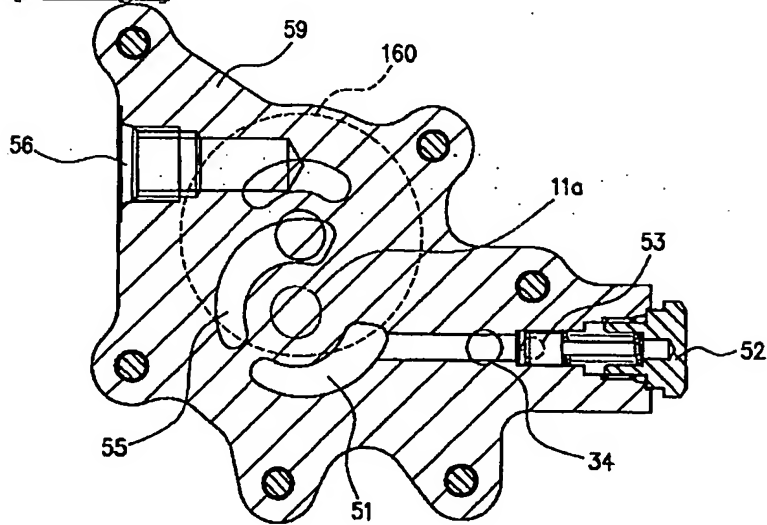


[Drawing 7]

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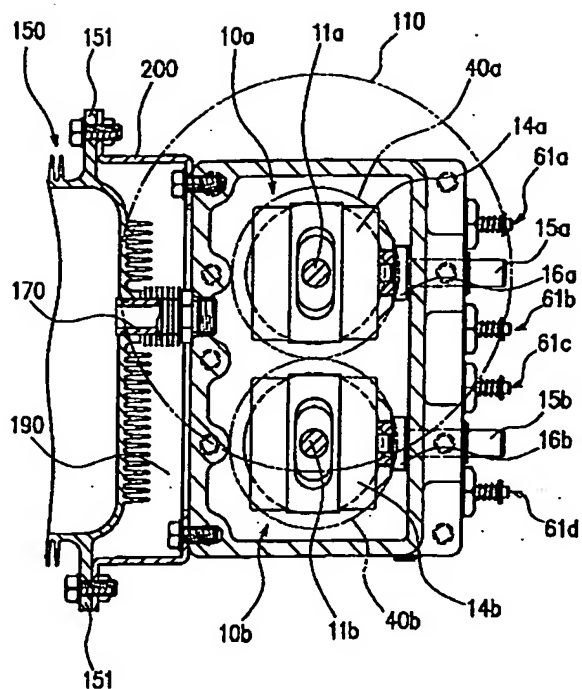


[Drawing 4]

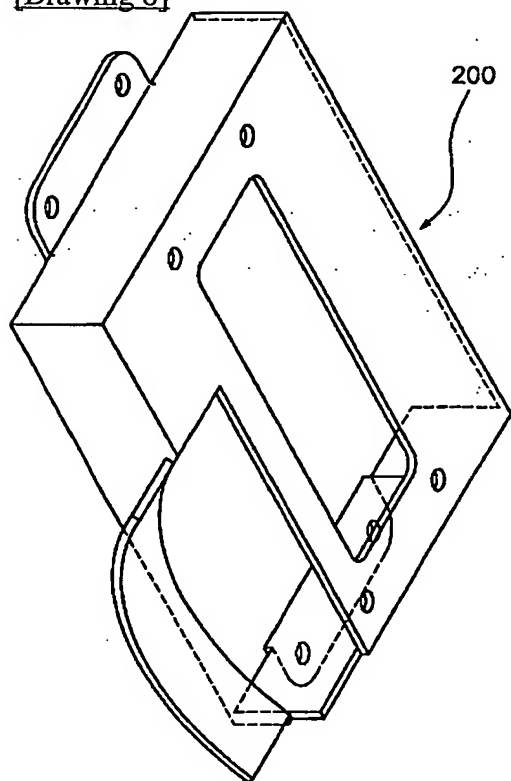


[Drawing 6]

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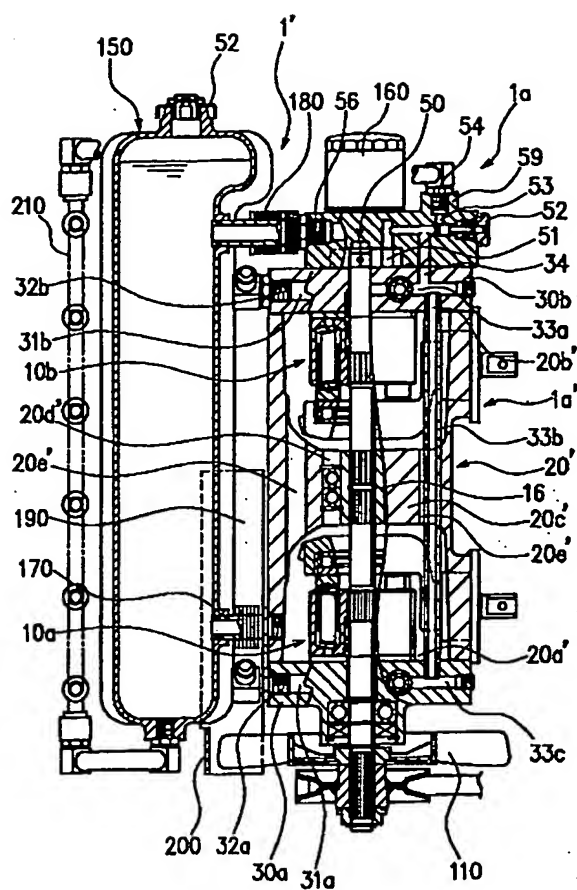


[Drawing 8]



[Drawing 9]

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